
**DIGITAL PAYMENT ADOPTION AND FINANCIAL INCLUSION IN
INDIA: A STATE-LEVEL EMPIRICAL ANALYSIS**

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Doi: <https://doi-doi.org/101555/ijarp.8339>**ABSTRACT**

Digital payments have become a central component of India's financial transformation. This study examines whether higher adoption of digital payments is associated with broader financial inclusion across Indian states. The empirical analysis uses FY 2024–25 state-level data for 14 major states/territories for which comparable public UPI-intensity observations were available, combined with Reserve Bank of India banking indicators. Digital-payment adoption is measured by UPI transactions per capita. Financial inclusion is represented by an equal-weighted composite index based on bank branches per 100,000 population, scheduled commercial bank deposits per capita, scheduled commercial bank credit per capita, and the credit-deposit ratio. Descriptive statistics, correlation analysis and an OLS regression with heteroskedasticity-robust standard errors are employed. The analysis identifies a positive cross-sectional association between UPI intensity and the composite financial-inclusion measure. Because the design is cross-sectional and the sample is limited by the availability of comparable state-wise UPI intensity data, the results should be interpreted as evidence of association rather than causation. The paper highlights the importance of combining digital-payment expansion with banking access, affordability, digital capability and responsible financial-service delivery.

KEYWORDS: Digital Payments; UPI; Financial Inclusion; FinTech; Indian States; Banking; Digital Finance; State-Level Analysis.

1. INTRODUCTION

India's payments ecosystem has undergone rapid digitalisation, particularly through the Unified Payments Interface (UPI). NPCI publishes state-wise UPI product statistics, while

the Reserve Bank of India (RBI) publishes comparable state-level banking data covering branches, deposits, credit and related indicators. The RBI's national Financial Inclusion Index also increased from 53.9 in March 2021 to 64.2 in March 2024, indicating continued expansion in access, usage and quality dimensions of financial inclusion.

National aggregates, however, can conceal substantial geographic differences. States vary in banking infrastructure, income, urbanization, and internet access and digital-payment intensity. Accordingly, a state-level analysis can provide a more differentiated understanding of whether digital payment adoption is associated with broader participation in formal finance.

The present study therefore investigates the following question: Is higher UPI transaction intensity associated with higher financial inclusion across Indian states? Rather than treating UPI adoption itself as financial inclusion, the study constructs a separate banking-based financial-inclusion index. This distinction reduces conceptual overlap between the explanatory and dependent variables.

2. Review of Literature

Digital payments have increasingly become an important mechanism for improving access to formal financial services. **Suri (2017)**, in her review of mobile money, found that digital financial services can reduce transaction barriers and improve financial access, particularly among underserved populations. **Demirgüç-Kunt et al. (2018)**, using Global Findex data, highlighted the growing role of mobile phones and digital payments in expanding account ownership and participation in formal finance. In the Indian context, **Khera et al. (2021)** explained that India's digital public infrastructure, including digital identity and interoperable payment systems, can reduce barriers to formal financial services. Similarly, **Sahi et al. (2021)**, using survey data from India, found that technology adoption plays an important role in promoting financial inclusion. The development of UPI has further strengthened India's digital-payment ecosystem. **Agarwal et al. (2024)** examined digital-payment adoption in India using RBI payment data and found that major economic and policy shocks significantly influenced the adoption of digital payment channels. **Haque, Azeez and Akhtar (2025)** studied UPI adoption in rural India and found that demographic and socioeconomic factors such as education, income and occupation influence UPI usage, indicating that digital literacy and economic capability remain important for inclusive adoption. **Khurana et al. (2025)**, using state-level Indian data, reported a positive relationship between FinTech development, digital payments and financial inclusion. These findings suggest that digital-payment

expansion can support financial inclusion, but the benefits may differ across geographical and socioeconomic groups. Recent studies have increasingly focused on the geographic dimension of digital payments. **Cooper et al. (2025)** examined India's UPI ecosystem and found that interoperability can significantly increase digital-payment usage by strengthening network effects. **Motheram and Buteau (2026)**, using district-level Indian data for 2020–2024, found that merchant networks and digital infrastructure are important determinants of UPI adoption. **Esakki (2026)**, in a study of Tamil Nadu, reported a positive relationship between UPI adoption, digital-payment usage and financial inclusion. These studies demonstrate that digital infrastructure, payment adoption and financial inclusion are closely interconnected. Overall, the literature indicates a generally positive association between digital payments and financial inclusion. However, much of the existing research focuses on individual-level surveys, national-level data or specific states, while comparatively fewer studies examine **state-level differences in UPI intensity alongside an independently constructed financial-inclusion index based on banking access and usage indicators**. Therefore, the present study addresses this gap by examining the relationship between **UPI transactions per capita and financial inclusion across selected Indian states using FY 2024–25 data**.

3. Objectives of the Study

- To examine differences in UPI adoption across selected Indian states.
- To construct a comparable state-level financial-inclusion index from banking indicators.
- To assess the association between UPI transaction intensity and financial inclusion.
- To provide evidence-based implications for digital-finance and financial-inclusion policy.

4. Hypotheses

H0: UPI transaction intensity has no statistically significant relationship with state-level financial inclusion.

H1: UPI transaction intensity has a statistically significant positive relationship with state-level financial inclusion.

5. Data and Methodology

The empirical sample contains 14 major states/territories: Telangana, Karnataka, Delhi, Maharashtra, Tamil Nadu, Kerala, Gujarat, Andhra Pradesh, Rajasthan, Madhya Pradesh, West Bengal, Odisha, Uttar Pradesh and Bihar. UPI intensity observations are reported on a

per-capita basis for FY 2024–25 in publicly available secondary compilations drawing on NPCI data. Banking indicators are taken from RBI's Handbook of Statistics on Indian States, 2024–25. RBI's banking tables cover the number of scheduled commercial bank offices, deposits and credit-related indicators through March 2025.

5.1 Variables

Variable	Measure	Role	Source
UPI intensity	UPI transactions per capita, FY2024–25	Independent variable	NPCI-based public compilation
Branch density	SCB offices per 100,000 population	FI component	RBI
Deposits per capita	SCB deposits per capita	FI component	RBI
Credit per capita	SCB credit per capita	FI component	RBI
Credit-deposit ratio	SCB credit/deposit ratio (%)	FI component	RBI
Financial Inclusion Score	Equal-weighted standardized composite of four banking indicators	Dependent variable	Author's calculation

5.2 Construction of Financial Inclusion Index

Each component was standardised using its sample mean and standard deviation. The four standardised components were then averaged and rescaled around a mean of 50 using $FI\ Score = 50 + 10 \times \text{mean}(Z\text{-components})$. Higher values indicate relatively stronger banking-based financial inclusion within the sample. This is an analytical index created for this study and should not be confused with RBI's official national FI-Index.

6. Empirical Dataset and Descriptive Results

State	UPI Tx/Capita	Branches/100k	Deposits/Capita (Rs)	Credit/Capita (Rs)	CD Ratio (%)	FI Score
Andhra Pradesh	142	14.98	98088	148210	151.1	54.82
Bihar	44	6.33	43748	22487	51.4	39.61
Delhi	241	19.33	1005346	922908	91.8	69.87
Gujarat	155	13.21	176816	140922	79.7	48.54
Karnataka	203	16.76	277751	188038	67.7	51.09
Kerala	162	21.09	255673	175903	68.8	53.3
Madhya Pradesh	87	9.03	76531	59924	78.3	44.15
Maharashtra	185	11.77	415394	407502	98.1	54.55
Odisha	76	12.6	124239	59759	48.1	44.13

Rajasthan	98	10.59	89330	79146	88.6	46.24
Tamil Nadu	178	17.04	188778	217849	115.4	54.67
Telangana	274	16.5	228308	254792	111.6	54.84
Uttar Pradesh	50	8.1	79579	40505	50.9	41.14
West Bengal	82	10.16	122528	63225	51.6	43.06

Descriptive evidence shows considerable cross-state variation in UPI intensity. The sample correlation between UPI transactions per capita and the composite financial-inclusion score is 0.848.

The simple OLS model estimates a positive coefficient of 0.095 FI-score points for each additional UPI transaction per capita, with $R^2 = 0.720$. The heteroskedasticity-robust p-value for the UPI coefficient is 0.0030.

7. Regression Results

Variable	Coefficient	Std. Error	t-statistic	Robust p-value
Constant	36.644	3.249	11.279	0.0000
UPI transactions per capita	0.095	0.032	2.972	0.0030

Model fit: $R^2 = 0.720$; adjusted $R^2 = 0.696$; $N = 14$. Robust standard errors (HC3) are reported.

8. DISCUSSION

The results indicate a positive cross-sectional association between digital-payment intensity and banking-based financial inclusion in the selected sample. This relationship is economically plausible because frequent digital-payment use can coexist with deeper engagement with formal bank accounts, deposits and credit. However, the result does not establish that UPI adoption causes financial inclusion. States with higher income, stronger infrastructure, greater urbanisation and more developed financial ecosystems may simultaneously exhibit higher UPI usage and stronger banking indicators.

The evidence therefore supports a complementary interpretation: digital payments can be an important channel within a broader financial-inclusion ecosystem, but digital payment growth alone should not be treated as a complete measure of financial inclusion.

9. Policy Implications

- Expand digital-payment infrastructure in regions where banking access and digital connectivity remain weaker.

- Combine payment adoption programmes with financial literacy and consumer-protection measures.
- Improve the availability and reliability of digital-payment infrastructure in rural and semi-urban areas.
- Encourage responsible use of digital transaction data while protecting privacy and preventing discriminatory financial decisions.
- Track digital-payment adoption and financial inclusion as related but distinct policy outcomes.

10. Limitations

The main limitation is data comparability. A complete five-year state-by-state UPI panel was not consistently exposed through the official public NPCI interface used for this study. Accordingly, the inferential analysis is restricted to FY 2024–25 and 14 observations for which comparable UPI-intensity figures could be identified. Population denominators used for the derived per-capita banking ratios are working estimates aligned to the study year; the paper therefore treats the results as an empirical state-level pilot rather than a causal panel estimate. Future research should use a directly downloadable annual state-level NPCI panel, official population projections for every year, and additional controls such as per-capita NSDP, internet penetration and literacy.

11. CONCLUSION

This study examined the relationship between digital-payment adoption and financial inclusion across selected Indian states. The empirical evidence indicates a positive association between UPI transaction intensity and a banking-based financial-inclusion measure. The findings reinforce the importance of viewing digital payments as part of a wider financial ecosystem involving access, usage, banking infrastructure and responsible financial services. Further research using a balanced multi-year state panel would allow stronger identification of temporal effects and improve causal interpretation.

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